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Response to Office Action and Request for Reconsideration

REMARKS

Claims 44-47 and 50 are pending in this application. Claims 1-43, 48, and 49 were prosecuted, and allowed, in the parent U.S. Application No. 09/891,699 to the present continuation application. The present continuation application is directed to taking up further prosecution of Claims 44-47 and 50, which were canceled in the parent application.

Rejection of Claims 1-8 Under 35 U.S.C. § 102

In paragraph 2 of the pending Office Action, the Examiner rejected Claims 44 and 50 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Number 5,805,290 to Ausschnitt et al., ("Ausschnitt"). In rejecting Claims 44 and 50, the Examiner asserted that Ausschnitt disclosed all the limitations recited in Claims 44 and 50. Applicant respectfully submits that Ausschnitt does not describe all of the limitations of Claims 44 and 50.

Claim 44 recites:

Claim 44. A reticle used for determining inter-field overlay error of a stage on a projection imaging tool, the reticle comprising:

a first set of alignment attributes disposed along a first column;

a second set of alignment attributes that are complementary to the first set of alignment attributes, the second set of alignment attributes disposed along a second column distinct from the first column, wherein the alignment attributes in the first and second sets are aligned in corresponding rows;

a third set of alignment attributes distributed along a first row between the first and second column; and

a fourth set of attributes complementary to the third set of attributes, the fourth set of alignment attributes disposed in a second row distinct from the first row, wherein the alignment attributes in the third and fourth sets are aligned in corresponding

columns, wherein the second and fourth alignment attributes are complementary to the first and third alignment attributes, respectively, in that an exposure of the second and fourth alignment attributes interlock with a previous exposure of the first and third alignment attributes after the reticle has been shifted in a desired direction.

Ausschnitt describes a method for determining critical dimension bias, or overlay error, in a substrate formed by a lithographic substrate. (See Ausschnitt Col. 3, lines 1-3). The Examiner asserted that "Ausschnitt discloses an overlay target having array elements (Fig. 18), and an optical metrology tool used to measure the array elements (col. 10, lines 33-35)" and that the overlay "target comprises four sets of alignment attributes." The Examiner also asserts that as shown "in Fig. 18, the second and fourth attributes are opposite to the first and third attributes, and therefore, also complementary to each other" and that the "second and fourth attributes are closely located to each other to form a united mark and therefore, are interlocked with each other as well."

Claim 44 recites that the "second and fourth alignment attributes are complementary to the first and third alignment attributes, respectively, in that an exposure of the second and fourth alignment attributes interlock with a previous exposure of the first and third alignment attributes after the reticle has been shifted in a desired direction." (Claim 44, emphasis added). Claim 50 includes similar limitations to Claim 44.

In contrast, Ausschnitt describes that "the image of target arrays 132, 134, 140 and 142 is exposed and etched on one level of a substrate and the image of target arrays 152, 154, 156 and 158 is exposed and etched on a different level of the

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substrate such that the center points 131, 151 of the target portions are coincident and the X and Y orientation of the respective element lengths are preserved." (See Ausschnitt Col. 9, line 66 - Col. 10, line 5). Thus, unlike Claims 44 and 50 where the reticle is shifted between exposures, Ausschnitt's exposures are coincident.

Furthermore, Ausschnitt goes on to state that the "bias and overlay error may be calculated for the X and Y directions by measurement of distances between edges within an array, or between arrays on the same or different levels." (See Ausschnitt Col. 10 lines 5-8). Because Ausschnitt calculates bias and overlay error by measuring the distances between edges of arrays, any "shift" of the array pattern would be considered an error and would make Ausschnitt inoperable.

Thus, Ausschnitt does not disclose all of the limitations recited in Claims 44 and 50 and therefore, Applicant submits that Claims 44 and 50 are not anticipated by Ausschnitt.

Rejection of Claims Under 35 U.S.C. § 103

Claims 45 and 47

In paragraph 4 of the pending Office Action, the Examiner rejected Claims 45 and 47 under 35 U.S.C. § 103 (a) as being unpatentable over Ausschnitt in view of U.S. Patent 5,700,602 to Dao et al., ("Dao"). In the rejection the Examiner stated that Ausschnitt disclosed all of the limitations of Claim 44, from which Claims 45 and 47 depend, either directly or indirectly. The Examiner noted that Ausschnitt fails to disclose that the reticle has reduced transmission. However, the Examiner asserted that Dao discloses an attenuated phase-shifting reticle that uses an embedded film, which is engineered to have a reduced transmission, and that it would have been

obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ausschnitt and Dao.

Applicant respectfully submits that neither Ausschnitt nor Dao, either individually or in combination, disclose all of the limitations of Claims 45 and 47. As discussed above, Ausschnitt does not describe all of the limitations of Claim 44, from which Claims 45 and 47 depend. The addition of Dao does not overcome these deficiencies. Neither Ausschnitt nor Dao recite that the reticle is shifted in a desired direction between exposures.

Dao describes a "method and apparatus for determining phase difference in a phase-shifted reticle." (Dao Col. 2, lines 62-63). Dao goes on to describe that a matrix of exposures of a reticle are made at different focal distances and different exposure levels. After exposure of each of the fields of the matrix, the wafer is developed and minimum, or critical, dimensions are measured. (See Dao Col. 5, lines 2-17) Thus, unlike Claims 45 and 47, Dao does not describe exposing different sets of attributes that "interlock" with a previous exposure "after the reticle has been shifted in a desired direction."

Furthermore, like Ausschnitt, any shift within one of Dao's exposures would be detrimental to Dao's measurement of the critical dimension, as the shift would be attributed to the critical dimension. Thus, both Ausschnitt and Dao teach away from shifting the reticle while forming their exposures and do not render Claims 45 and 47 obvious.

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Applicant respectfully submits that Claims 45 and 47 are patentable over Ausschnitt and Dao, both individually or in combination. Thus, Claims 45 and 47 are in condition for allowance.

Claim 46

In paragraph 5 of the pending Office Action the Examiner rejected Claim 46 under 35 U.S.C. § 103(a) as being unpatentable over Ausschnitt in view of Dao and further in view of U.S. Patent 5,262,257 to Fukuda ("Fukuda").

In rejecting Claim 46 the Examiner asserted that Ausschnitt, as modified by Dao, discloses all of the limitations of Claim 45 from which Claim 46 depends. The Examiner acknowledged that Ausschnitt and Dao failed to disclose a reticle comprising a partially reflecting dielectric coating, but the Examiner asserted that Fukuda disclosed this limitation because Fukuda disclosed an alignment pattern of a mask formed by a dielectric material film.

Applicant respectfully submits that neither Ausschnitt, Dao, nor Fukuda, either individually or in combination, disclose all of the limitations of Claim 46. As discussed above, neither Ausschnitt, nor Dao, either individually or in combination, describe all of the limitations of Claim 45 from which Claim 46 depends. The addition of Fukuda does not overcome these deficiencies. None of the references recite that the reticle is shifted in a desired direction between exposures.

Fukuda describes techniques for manufacturing a "mask having a high efficiency by which the signal-to-noise ratio of the alignment signal light can be improved to assure high-precision and high speed alignment." (Fukuda Col. 3, lines 13-17). Thus, Fukuda does not describe exposing sets of alignment attributes that

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interlock with previous exposures of different sets of alignment attributes after the reticle has been shifted in a desired direction, as is described in Claim 46.

Furthermore, like Ausschnitt and Dao, any shift of the reticle between exposures would be detrimental to Fukuda's high precision alignment. Thus, Fukuda, like Ausschnitt and Dao, teaches away from shifting the reticle while forming exposures.

Applicant respectfully submits that Claim 46 is patentable over Fukuda, Ausschnitt, and Dao, individually or in combination. Thus, Claim 46 is in condition for allowance.

Conclusion

Applicant respectfully submits that all the pending claims in the application, Claims 44-47 and 50, are in condition for allowance. Reconsideration and further examination of the application are requested. A Notice of Allowance is solicited.

Respectfully submitted,
HELLER, EHRMAN, WHITE & McAULIFFE LLP

By: 
Alan C. Gordon
Registration No. 51,220

Attorney Docket No. 38203-6082B

Address all correspondence to:

Alan C. Gordon
HELLER EHRMAN WHITE & McAULIFFE, LLP
4350 La Jolla Village Drive, Suite 600
San Diego, CA 92122-1246
Telephone: (858) 450-8400 Facsimile: (858) 450-8499
Email: alangordon@hewm.com

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